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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
TURNER, SAMUEL A	
ART UNIT	**PAPER NUMBER**
2877	

DATE MAILED: 02/23/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/761,592	HUMPHREY, IAN
	Examiner	**Art Unit**
	Samuel A. Turner	2877

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 September 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-13* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-13* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *21 January 2004* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *9/27/04*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Drawings

The drawings are objected to because in figure 3 the beam-splitter 24 and the phase modulator 26 are confusing. In figure 3, beam-splitter 24 is oriented such that light from the source 22 is directly passed to the electrical subsystem 14 and light from the fiber coil is never directed to the electrical subsystem 14. Further, beam-splitter 24 is to divide the source beam 15 into counter-rotating beams. From figure 3, it appears that the phase modulator is dividing and recombining the counter-rotating beams. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application.

Replacement Drawing Sheets

Drawing changes must be made by presenting replacement sheets which incorporate the desired changes and which comply with 37 CFR 1.84. An explanation of the changes made must be presented either in the drawing amendments section, or remarks, section of the amendment paper. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). A replacement sheet must include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of the amended drawing(s) must not be labeled as "amended." If the changes to the drawing figure(s) are not accepted by the examiner, applicant will be notified of any required corrective action in the next Office action. No further drawing submission will be required, unless applicant is notified.

Identifying indicia, if provided, should include the title of the invention, inventor's name, and application number, or docket number (if any) if an application number has not been assigned to the application. If this information is provided, it must be placed on the front of each sheet and within the top margin.

Annotated Drawing Sheets

A marked-up copy of any amended drawing figure, including annotations indicating the changes made, may be submitted or required by the examiner. The annotated drawing sheet(s) must be clearly labeled as "Annotated Sheet" and must be presented in the amendment or remarks section that explains the change(s) to the drawings.

Timing of Corrections

Applicant is required to submit acceptable corrected drawings within the time period set in the Office action. See 37 CFR 1.85(a). Failure to take corrective action within the set period will result in ABANDONMENT of the application.

If corrected drawings are required in a Notice of Allowability (PTOL-37), the new drawings MUST be filed within the THREE MONTH shortened statutory period set for reply in the "Notice of Allowability." Extensions of time may NOT be obtained under the provisions of 37 CFR 1.136 for filing the corrected drawings after the mailing of a Notice of Allowability.

Specification

The disclosure is objected to because of the following informalities: at page 11, line one the rotation rate is defined as "Q" and not -Ω-. Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-13 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

While applicant can refer to claim limitations in the alternative, "A or B", or can refer to one or a plurality of elements, "at least one of", the metes and bounds of the claims must be set forth. However when the list of potential alternatives varies ambiguity can arise.

With regard to claims 1 and 11, applicant uses the phrase "one or more" four different times. Because of the plurality of alternatives, the number of optical and/or electrical components is indefinite. This only escalates in the dependent claims. For example, claim 2 uses the phrase "one or more" ten different times. Claims 1-13 refer to "one or more" so many times that the metes and bounds of the claims are indefinite.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-13 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Noureldin et al(IEEE-1999).

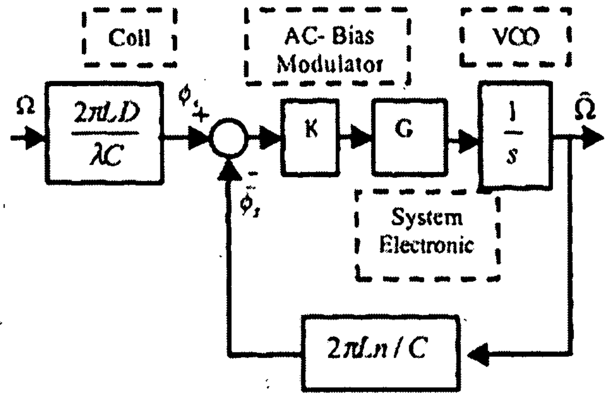

Figure 2. The FOG as a closed loop

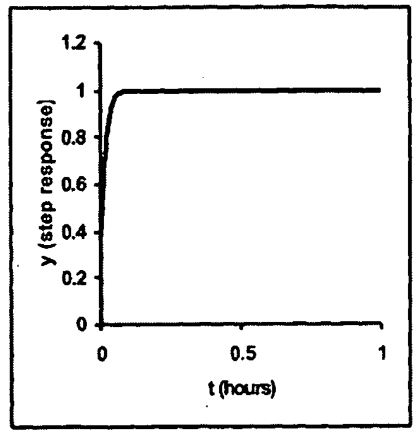

Figure 3. The FOG step response.
L=1000m; D=0.1m; G=1000; λ=0.85μm; n=1.48; K=0.5815;

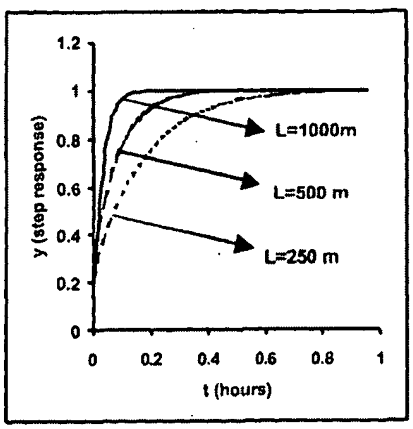

Figure 4. The FOG step response for different values of L. G = 500. The rise time is 100, 200, 400 seconds for L =1000, 500, 250 meters respectively.

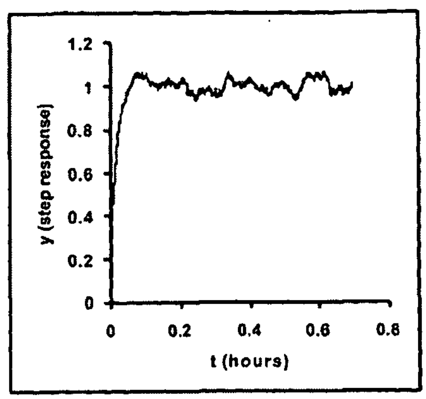

Figure 6. The FOG step response with the effect of the angle random walk at G = 1000

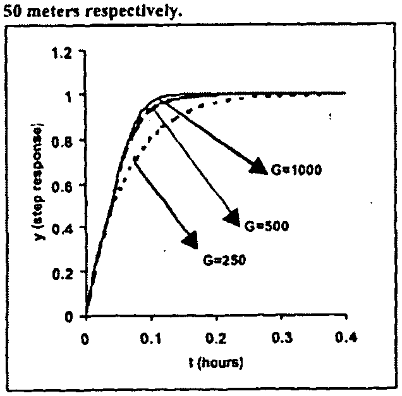

Figure 5. The FOG step response for different values of G. L = 1000 m. The rise time is 50, 100, 200 seconds for G = 1000, 500, 250 respectively.

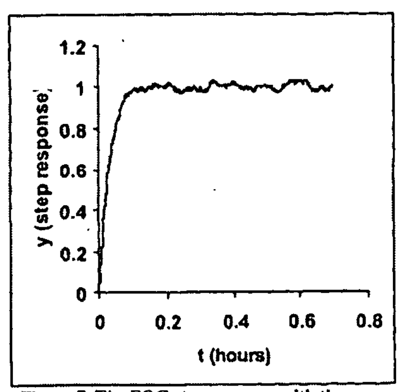

Figure 7. The FOG step response with the effect of the angle random walk at G = 500

With regard to claim 1, Noureldin et al teach a process for modeling a closed loop fiber optic gyroscope comprising the step of:

computing one or more parameters of a fiber optic gyroscope(**page 635, section 3**) through employment of a closed-loop transfer function(**figure 2, equation 5**) based on one or more characteristics of:

one or more optical components of the fiber optic gyroscope(**page 633, section 2**); and

one or more electrical components of the fiber optic gyroscope(**page 633, section 2**).

As to claim 2, wherein the step of computing the one or more parameters of the fiber optic gyroscope through employment of the closed-loop transfer function based on the one or more characteristics of the one or more optical components of the fiber optic gyroscope and the one or more electrical components of the fiber optic gyroscope comprises the step of:

computing one or more performance parameters(**page 635, section 3**) of the fiber optic gyroscope through employment of one or more physical parameters of one or more of the one or more optical components and one or more of the one or more electrical components(**page 635, section 2**).

As to claim 3, wherein the step of computing the one or more performance parameters of the fiber optic gyroscope through employment of the one or more

physical parameters of the one or more of the one or more optical components and the one or more of the one or more electrical components comprises the steps of:

determining one or more relationships between the one or more performance parameters and the one or more physical parameters(**page 635, section 3.1-3.3**); and

employing one or more of the one or more relationships to compute the one or more performance parameters(**figure 3, page 635**).

As to claim 4, wherein the step of employing the one or more of the one or more relationships to compute the one or more performance parameters comprises the steps of:

substituting one or more known values of the one or more physical parameters into the one or more relationships(**figure 3, page 635**); and

employing the one or more known values of the one or more physical parameters to compute the one or more performance parameters(**figure 3; page 635, section 3.1-3.3**).

As to claim 5, further comprising the step of:

determining one or more desired values of the one or more physical parameters for employment in causation of the one or more performance parameters to equal or approach one or more provided performance parameter values for the fiber optic gyroscope(**figures 3-7; page 635, section 3.1-3.3**).

As to claim 6, wherein the step of determining the one or more desired values of the one or more physical parameters for employment in causation of the one or more performance parameters to equal or approach the one or more provided performance parameter values for the fiber optic gyroscope comprises the step of:

employing the one or more desired values of the one or more physical parameters to design the fiber optic gyroscope to equal or approach the one or more provided performance parameter values(**figures 3-7; page 635, section 3.1-3.3**).

As to claim 7, wherein the step of employing the one or more of the one or more relationships to compute the one or more performance parameters comprises the step of:

employing the one or more of the one or more relationships and one or more initial values of the one or more physical parameters to compute the one or more performance parameters(**figures 3-7; page 635, section 3.1-3.3**).

As to claim 8, wherein the step of employing the one or more of the one or more relationships and the one or more initial values of the one or more physical parameters to compute the one or more performance parameters comprises the steps of:

determining a difference between the one or more performance parameters and one or more provided parameter values for the fiber optic gyroscope(**figures 4-7, page 636**);

iteratively adjusting one or more of the one or more initial values of one or more of the one or more physical parameters through employment of the one or more of the one or more relationships(**figures 4 and 5, page 636**); and

iteratively computing the one or more performance parameters through employment of the one or more relationships and the one or more of the one or more initial values(**figures 6 and 7, page 636**).

As to claim 9. The process of claim 2, wherein the one or more physical parameters comprise one or more of:

an optical power of a light beam in a representation of a first phase modulator in a representation of a feedforward component of the closed-loop transfer function of the fiber optic gyroscope(K);

an operating phase bias applied to one or more counterpropagating light beams in the representation of the first phase modulator in the representation of the feedforward component of the closed-loop transfer function of the fiber optic gyroscope(A,G).

As to claim 10, wherein the closed-loop transfer function comprises one or more of:

a summing point(**figure** 2) that receives:

an input based on a rate of rotation of an optical waveguide of a feedback component and a scale factor based on a wavelength of light propagating through the optical waveguide(**figure 2, section 2**),

an optical path length of the optical waveguide, and a diameter of the optical waveguide, as a positive input(**figure 2, section 2**), and

an input based on a modulated first light beam and a modulated second light beam exiting the optical waveguide of the feedback component as a negative input(**figure 2, section 2**);

wherein the summing point employs the positive input and the negative input to determine a difference between the positive input and the negative input(**figure 2, section 2**);

a feedforward component that receives the difference between the positive input and the negative input as an input(**figure 2, section 2**);

wherein the feedforward component employs the difference between the positive input and the negative input to provide a signal proportional to a phase difference between the modulated first light beam and the modulated second light beam exiting the optical waveguide of the feedback component as an output(**figure 2, section 2**);

wherein the feedback component receives the signal proportional to the phase difference between the modulated first light beam and the modulated second light beam exiting the optical waveguide of the feedback component as an input(**figure 2, section 2**);

wherein the feedback component employs the signal proportional to the phase difference between the modulated first light beam and the modulated second

light beam exiting the optical waveguide of the feedback component to produce a feedback signal(**figure 2, section 2**);

wherein the feedback component employs the feedback signal to produce the modulate first light beam and the modulated second light beam exiting the optical waveguide of the feedback component(**figure 2, section 2**).

With regard to claim 11. An article, comprising:

one or more storage media readable by a processor(**computer simulation,page 633**);

means in the one or more storage media for computing one or more parameters of a fiber optic gyroscope through employment of a closed-loop transfer function based on one or more characteristics of:

one or more optical components of the fiber optic gyroscope(**figure 2, section 2**); and

one or more electrical components of the fiber optic gyroscope(**figure 2, section 2**).

As to claim 12, wherein the means in the one or more storage media for computing the one or more parameters of the fiber optic gyroscope through employment of the closed-loop transfer function based on the one or more characteristics of the one or more optical components of the fiber optic gyroscope and the one or more electrical components of the fiber optic gyroscope comprises:

means in the one or more storage media for determining one or more relationships between one or more physical parameters and one or more performance parameters of:

one or more of the one or more optical components(**figure 2, section 2**); and

one or more of the one or more electrical components(**figure 2, section 2**); and

means in the one or more storage media for employing one or more of the one or more relationships to determine the one or more performance parameters(**figure 2, section 3**).

As to claim 13, wherein the one or more performance parameters comprise one or more of a bandwidth of the fiber optic gyroscope, a coefficient of random walk of the fiber optic gyroscope, an operating frequency of the fiber optic gyroscope, and a power spectral density of noise of the fiber optic gyroscope(**section 3**).

Relevant Prior Art

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Beilas(SPIE-1994) which teaches a different closed loop model, figures 2 and 3.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Samuel A. Turner whose phone number is 571-272-2432.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory J. Toatley, Jr., can be reached on 571-272-2800 ext. 77.

The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Samuel A. Turner
Primary Examiner
Art Unit 2877